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THE CONTROL OF THE TWO-SPOTTED MITE[1] ON LIMA BEANS IN CALIFORNIA

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The damage caused by the two-spotted mite to lima beans in Orange and Los Angeles Counties, Calif., since 1941, has made control measures necessary. Sulfur has long been recognized as the remedy for this pest on cultivated crops, but its application has not always resulted in satisfactory control. Experiments made during 1943 to determine when and how to apply sulfur to lima beans for mite control and to develop supplementary measures of control have led to the suggestions given in this circular. These should aid the bean grower in California in protecting his beans.

When to Apply Sulfur

Lima beans in southern California can be protected from appreciable mite injury by one or two applications of "conditioned" dusting sulfur. The period in which applications are made, with respect to crop growth and mite infestation, is the important factor. It has been found that, to be most successful, sulfur should be applied within a period from 40 to 60 days after planting. The mites do not become numerous enough to damage the crop until more than 40 days after planting. On the other hand, applications need not be made later than 60 days after planting to protect the plants for the rest of the season. The dusting period for beans planted May 1 would be from June 10 to 30 and for those planted May 15 it would be from June 25 to July 15. During these periods the plants are small enough to permit dusting equipment to pass through without plant damage and to make control possible by use of a moderate amount of sulfur per acre. Experimental plots dusted 30 days after planting became heavily infested before harvest-time. Plots dusted 67 to 77 days after planting required a larger amount of sulfur per acre, and the plants were damaged because they were too large to allow the dusting equipment to pass through freely.

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1/ The name "two-spotted mite" is proposed for Tetranychus bimaculatus Harvey, one of the several species that have been known as common red spiders, or spider mites.

2/ The author wishes to acknowledge the cooperation and assistance of the Departments of Agriculture of Orange and Los Angeles Counties in the field work done on this problem.

Dusting should be done when there is little or no air movement either at night or during the morning before the wind becomes too strong to permit thorough coverage of the plants.

Number and Rate of Applications

In situations not previously subject to serious mite damage, such as localities where alfalfa is not being grown, one application of dusting sulfur at the rate of 30 pounds per acre, 45 to 50 days after planting, is recommended. In localities subject to early or heavy mite infestations, or where there is a possibility of serious mite damage, two applications of sulfur should be made, at 30 and 50 pounds per acre, respectively, the first 40 to 45 days after planting and the second about 2 weeks later. The second application need not cover more than 64 marginal rows on each side of the field and a border of the same width across each end.

Dusting Equipment

The most satisfactory dusting machines for lima beans are of the row type capable of covering eight rows at a time and mounted on, or pulled by, tractors. It is very important to get the dust evenly distributed on the under sides of the leaves. This can be done by using dusting machines equipped with nozzles to direct the dust to both sides of each row. If one outlet per row is used, the dust can be directed to the under sides of the leaves with a Y nozzle carried between the rows. If two outlets per row are used, the nozzles should be so directed that the dust strikes the plants from both sides and from below. In the case of 8-row dusters, larger air volume and less friction will be obtained with eight 2-inch tubes or outlets than with sixteen 1¼-inch tubes. When nozzles or tubes become clogged with dust material, they may be cleaned by running a small amount of scouring sand through the machine.

The cost of custom dusting in 1943 ranged from $2.50 to $5.00 per hour for labor and equipment, plus $1.00 to $1.65 per acre for sulfur. With 8-row dusters, from 8 to 10 acres were usually dusted per hour. This dusting resulted in an increased yield ranging from 400 to 500 pounds in some fields as compared with the yield from untreated areas within the fields.

Indirect Control

Any practice that reduces the number of mites on other nearby infested plants early in the season will tend to reduce infestation in the bean fields. Therefore, the treatment of alfalfa, roadsides, or other sources of mite infestations with sulfur early in the season is of value. Likewise, the destruction, along roadsides and ditch banks, of morning-glory plants and other weeds that are infested with the two-spotted

mite will help to control this pest.

Caution: Dust goggles should be worn when sulfur is being handled, since it is irritating to the eyes. Eye irritation is much more severe during dusting operations than at threshing time. Unless the amount of sulfur used per acre is far in excess of the amount recommended, eye irritation at threshing time is slight and is usually not noticeable until the eyes and face are washed. Precaution should be taken to prevent the sulfur from igniting during dusting operations. Rubber-tired tractors and dusters should be grounded by a dragging chain. Sulfur should be kept away from hot motors and motor exhausts.

Description and Habits

The two-spotted mite, or common red spider, is a tiny spider-like creature not quite large enough to be readily seen with the naked eye. It is usually reddish, but the color may range from yellow, orange, or brown, to green, and often, but not always, it has two minute dark spots on the upper part of the body. Several kinds of spider mites will feed on lima beans, but during 1943 the two-spotted mite was commonly found on this crop. With the latter the green color may predominate during midsummer when the plants are green and succulent. However, many red, yellow, orange, or brown two-spotted mites may always be found. As the season advances, most of the mites may be orange or red.

The adult females lay 6 or 7 eggs per day. The young mites that hatch from these eggs grow very rapidly and may mature in 10 days. Under low temperatures they do not develop so fast, but under high temperatures mites increase so rapidly that they seem to appear suddenly in lima bean fields and may cause considerable damage before they are noticed.

The two-spotted mite is able to live and develop on a wide variety of plants. It is difficult to name a cultivated plant upon which it has not been found, and after the beans have been harvested it will feed on almost any available weeds. Morning-glory is a common food plant, and alfalfa is the most conspicuous cultivated food plant associated with lima beans. The mites are apparently able to survive the winter and build up in the spring more successfully on alfalfa than on other plants around lima bean fields. By the time the beans are up, the mites may already be developing on alfalfa. In many bean fields, especially in those formerly in alfalfa, the mites are often present and well distributed on the plants by the time the trifoliate bean leaves appear. The cutting and hauling of green alfalfa is a well-known means of scattering the mites. This dispersal is especially noticeable in bean fields to the leeward of alfalfa fields and along the roads where stalks of hay are lost from the hay trucks as they pass. Weedy ditch banks and roadsides, as well as farm gardens and home yards, are likewise important sources from which mites spread to nearby bean fields.

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